

REMARKS/ARGUMENTS

Claims 1, 2, 5-11, 13-21, 23 and 24 are pending in the present application. Claims 1, 2, 5-11, 13-21, 23 and 24 have been rejected. Independent claims 1, 10 and 19 have been amended. Support for the amendments to claims 1, 10 and 19 may at least be found at page 5, lines 14-22 of Applicants' specification and at least at col. 7, l. 67-col. 8, l. 1 of U.S.P.N. 5,449,536 to Funkhouser et al., incorporated by reference therein. No new matter is being introduced as a result of the entry of these amendments. Applicants believe the following remarks place the claims in condition for allowance.

Rejections under 35 U.S.C. §103(a)

The Examiner rejected claims 1, 5-10, 13-20 and 23-24 under 35 U.S.C. §103(a) as being unpatentable over U.S.P.N. 6,495,793 to Tewari ("Tewari") in view of U.S.P.N. 6,387,541 to Gray et al. ("Gray").

Applicants' amended independent claim 1 recites the following:

1. A method of repairing an article affected by sulphidation, comprising the steps of: providing an article having a section affected by sulphidation; removing the affected section; positioning a laser apparatus over the article such that a focal point of said laser is about 0.10 inches to about 1 inch above the affected section and said laser forms a defocused hot zone at a distance above the affected section sufficient to prevent the article from melting; introducing a replacement section material into the defocused hot zone to heat the replacement section material; causing the replacement section material to form a replacement section on the article; heat treating the replacement section; machining excess material from the article; and heat treating the replacement section a second time.

Applicants' amended independent claim 10 recites the following:

10. A method of repairing an article affected by sulphidation, comprising the steps of: providing an article having a section affected by sulphidation; removing the affected section by machining; positioning a laser apparatus over the article such that a focal point of said laser is about 0.10 inches to

about 1 inch above the affected section and said laser forms a defocused hot zone at a distance above the affected section sufficient to prevent the article from melting; introducing a replacement section material into the defocused hot zone to heat the replacement section material; causing the replacement section material to form a replacement section on the article; heat treating the replacement section; removing excess material resulting from the replacement section material; and heat treating the replacement section a second time.

Applicants' amended independent claim 19 recites the following:

19. A method of repairing an airfoil affected by sulphidation, comprising the steps of: providing an airfoil having a section affected by sulphidation; removing the affected section of the airfoil by machining; positioning a laser apparatus over the airfoil such that a focal point of said laser is about 0.10 inches to about 1 inch above the affected section and said laser forms a defocused hot zone at a distance above the affected section sufficient to prevent the airfoil from melting; introducing a replacement section material into the defocused hot zone to heat the replacement section material; causing the replacement section material to form a replacement section on the airfoil; heat treating the replacement section; restoring the dimensions of the airfoil; and heat treating the replacement section a second time.

Tewari teaches a method for weld repairing, without preheating, a gas turbine engine blade airfoil (col. 2, ll. 54-56). The laser beam, operating in a power range of about 50-10000 watts per centimeter, is focused away from the substrate surface to provide a laser spot in the size range of about 0.03-0.2 inches (Abstract; col. 4, ll. 35-43). The laser repair conducts the repair at ambient temperature without preheating the substrate surface and by controlling processing parameters to avoid cracking of the resulting weld bead during and after welding (Abstract; col. 4, ll. 15-25). Controlling the heat input at the surface of the weld repair is provided through selection of a combination of laser power, laser beam focus away from the substrate surface to provide a selected spot size range, power feed rate and relative movement between the substrate surface and the laser spot (col. 2, ll. 33-38 and col. 4, ll. 18-25). In an example, Tewari teaches the laser beam was focused away from the surface portion of the airfoil tip to provide on the radially outer surface a laser spot in the range of about 0.03-0.20 inches in diameter to

reduce the overall power density (power per unit area) (col. 5, ll. 8-16). During such relative movement under these conditions, the repair powder was deposited substantially concentrically in the laser beam above the laser spot (col. 5, ll. 16-20).

Applicants' amended independent claims 1, 10 and 19 recite in part the following, "positioning a laser apparatus over the airfoil such that a focal point of said laser is about 0.10 inches to about 1 inch above the affected section and said laser forms a defocused hot zone at a distance above the affected section sufficient to prevent the airfoil from melting;". Tewari does not teach or suggest placing the focal point of the laser at "about 0.10 inches to about 1 inch above the affected section" or airfoil tip as taught therein. In addition, Gray does not teach or suggest placing the focal point of a laser at "about 0.10 inches to about 1 inch above the affected section" when applying the coating(s) taught therein. The combination of teachings of Tewari in view of Gray do not teach, suggest or provide the requisite motivation to one of ordinary skill in the art to modify their teachings and place the focal point of the laser at "about 0.10 inches to about 1 inch above the affected section" as recited in Applicants' amended independent claims 1, 10 and 19.

The placement of the focal point of the laser at said distance would not have been obvious to try given the combined teachings of Tewari and Gray. Tewari teaches and suggests controlling the heat input at the surface of the weld repair using a combination of laser power, laser beam focus away from the substrate surface to provide a selected spot size range, power feed rate and relative movement between the substrate surface and the laser spot. Tewari neither teaches nor suggests the placement of the focal point of the laser at said distance, or any particular or significant distance for that matter, as a way to control the heat input at the surface of the weld repair. Gray is silent with respect to such operating parameters. One of ordinary skill in the art could try varying all of these parameters enumerated by Tewari or try each of numerous possible choices until one possibly arrived at a successful result. However, Tewari provides no clear teaching or suggestion to place the focal point of the laser at said distance or suggest any criticality

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associated with placing the focal point of the laser at said distance or whether the placement of the laser at said distance would likely be successful in practicing the method of Tewari. In turn, the combination of Tewari in view of Gray does not teach, suggest or provide the requisite motivation necessary to modify their combined teachings and achieve all of the claim elements of Applicants' amended independent claims 1, 10 and 10.

Applicants contend the subject matter of claims 1, 5-10, 13-20 and 23-24 are patentable over the combination of Tewari in view of Gray.

For these reasons, Applicants respectfully request the Examiner withdraw the rejection under 35 U.S.C. §103(a) and find claims 1, 5-10, 13-20 and 23-24 are allowable.

The Examiner rejected claims 2, 11, and 21 under 35 U.S.C. §103(a) as being unpatentable over Tewari and Gray et al. in view of U.S.P.N. 6,173,491 to Goodwater et al. ("Goodwater").

Applicants' amended independent claims 1, 10 and 19 recite in part the following, "positioning a laser apparatus over the airfoil such that a focal point of said laser is about 0.10 inches to about 1 inch above the affected section and said laser forms a defocused hot zone at a distance above the affected section sufficient to prevent the airfoil from melting;".

As discussed above, the combination of Tewari in view of Gray does not teach, suggest or provide the requisite motivation to one of ordinary skill in the art to modify the combination of teachings in order to place a focal point of a laser about 0.10 inches to about 1 inch above the affected section as recited in Applicants' amended independent claims 1, 10 and 19. Goodwater generally teaches a method for refurbishing turbine engine vanes (Abstract). However, the teachings of Goodwater when combined with Tewari and Gray also fail to teach or suggest the placement of a focal point of a laser at said distance.

Applicants contend the subject matter of claims 2, 11 and 21 are patentable over the combination of Tewari and Gray in view of Goodwater.

For these reasons, Applicants respectfully request the Examiner withdraw the rejection under 35 U.S.C. §103(a) and find claims 2, 11 and 21 are allowable.

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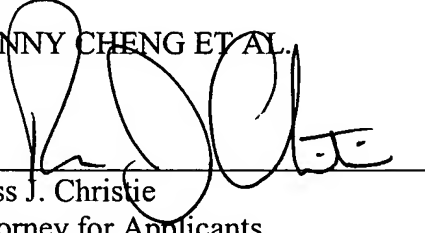
CONCLUSION

An earnest and thorough effort has been made to place all claims in this application in condition for allowance and respond to all issues set forth in the aforesaid Office action. If upon consideration of this response, the Examiner feels that any issues remain which could be disposed of by telephone interview, the undersigned respectfully requests and appreciates same.

It is believed that no additional fee is due in connection with this paper. If any fee is due, please charge same to Deposit Account No. 21-0279.

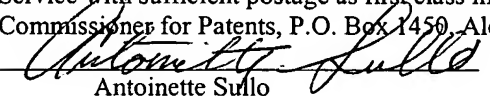
Respectfully submitted,

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I, Antoinette Sullo, hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to: "Mail Stop Amendments, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313" on January 17, 2007.


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